What is claimed is:

1. An electric power steering device comprising:

an electric motor;

a controller including a switching transistor working to control a duty cycle of current and a control substrate to which the switching transistor is connected electrically, said controller determining a steering assist torque to be outputted from said electric motor as a function of a steering torque added to a steering shaft;

a torque transmission mechanism working to transmit the steering assist torque outputted from said electric motor to the steering shaft;

a shell within which said torque transmission mechanism is disposed; and

a support member working to support the steering shaft and said controller, said support member being secured within said shell.

2. An electric power steering device as set forth in claim 1, wherein said support member has a hollow cylindrical protrusion extending in a longitudinal direction of the steering shaft, the hollowing cylindrical protrusion having an inner wall which supports the steering shaft rotatably through a bearing and an outer wall around which the control substrate is placed.

3. An electric power steering device as set forth in claim 1, further comprising a torque sensor installed on the steering shaft which works to measure the steering torque added to the steering shaft in a magnetic fashion, and wherein said support member has an inner peripheral surface facing the torque sensor, the inner peripheral surface having disposed thereon a magnetic collection member working to collect a magnetic flux produced from the torque sensor.

4. An electric power steering device as set forth in claim 1, wherein said controller controls the duty cycle of current supplied to said electric motor as a function of the determined steering assist torque to have said electric motor output the determined steering assist torque, wherein said shell is made of aluminum, and further comprising feeder lines connecting between said electric motor and the control substrate for feeding the current to said electric motor, said feeder lines being disposed within said shell.

5. An electric power steering device as set forth in claim 4, further comprising a motor housing within which said electric motor is disposed, said motor housing being joined to said shell so that joint of said electric motor and the feeder lines is located close to a joint of said controller and the feeder lines.

6. An electric power steering device as set forth in claim 5, wherein said torque sensor, said controller, said electric motor, and

said torque transmission mechanism are disposed within said shell and said motor housing integrally.

7. An electric power steering device as set forth in claim 1, wherein said shell is made up of a housing to which said support member is secured and a cover closing an open end of said housing, and wherein said support member is placed in a nip formed between said housing and said cover laid to overlap with each other in a longitudinal direction of the steering shaft.

8. An electric power steering device as set forth in claim 1, wherein said switching transistor is installed on said support member.

9. An electric power steering device as set forth in claim 8, wherein said shell has formed on an inner wall thereof an extension extending in a radius direction of the steering shaft to cover a worm gear installed in said torque transmission mechanism working to reduce speed of said electric motor, and wherein said support member has an abutment portion abutting said extension of said shell.

10. An electric power steering device as set forth in claim 9, wherein said switching transistor is located in proximity to said abutment portion.

11. An electric power steering device as set forth in claim 10, wherein said switching transistor is installed on a surface of said support member substantially opposed to the abutment portion.

12. An electric power steering device as set forth in claim 1, wherein said support member has a first end and a second end which are opposed to each other in a longitudinal direction of the steering shaft, the first end having said controller mounted thereon, the second end having a worm gear of said torque transmission mechanism mounted thereon, and wherein said support member is in abutment of an entire periphery thereof to an inner wall of said shell .

13. An electric power steering device as set forth in claim 1, further comprising a torque sensor installed on the steering shaft which works to measure the steering torque added to the steering shaft, said torque sensor having a non-rotatable portion provided on an inner peripheral surface of said support member.

14. An electric power steering device as set forth in claim 1, wherein said steering shaft includes a first shaft, a second shaft, and an elastic member which joins the first and second shafts in alignment with each other and twists subjected to input of the steering torque to one of the first and second shafts, and further comprising a torque sensor including (a) a hard magnetic member which is joined to the first shaft and produces a magnetic field

therearound, (b) a soft magnetic member which is joined to the second shaft, placed within the magnetic field to form a magnetic circuit, and works to change a density of magnetic flux produced in the magnetic circuit when the soft magnetic member is changed in relative position to the hard magnetic member due to twisting of the elastic member, (c) a pair of auxiliary soft magnetic members which is disposed close to the soft magnetic member, and (d) a magnetic sensor which works to measure a density of magnetic flux flowing between the auxiliary soft magnetic members as a function of the steering torque, and wherein one of the auxiliary soft magnetic members has a magnetic flux collecting portion which is opposed to the other auxiliary soft magnetic member in a radius direction of the steering shaft and functions to collect the magnetic flux from the soft magnetic member, and wherein the magnetic sensor is disposed between the magnetic flux collecting portion and said other auxiliary soft magnetic member.

15. An electric power steering device as set forth in claim 1, wherein said steering shaft includes a first shaft, a second shaft, and an elastic member which joins the first and second shafts in alignment with each other and twists subjected to input of the steering torque to one of the first and second shafts, and further comprising a torque sensor including (a) a hard magnetic member which is joined to the first shaft and produces a magnetic field therearound, (b) a soft magnetic member which is joined to the second shaft, placed within the magnetic field to form a magnetic

circuit, and works to change a density of magnetic flux produced in the magnetic circuit when the soft magnetic member is changed in relative position to the hard magnetic member due to twisting of the elastic member, (c) a pair of auxiliary soft magnetic members which is disposed close to the soft magnetic member, and (d) a magnetic sensor which works to measure a density of magnetic flux flowing between the auxiliary soft magnetic members as a function of the steering torque, and wherein the auxiliary soft magnetic members have magnetic flux collecting portions, respectively, which are opposed to each other in a radius direction of the steering shaft and function to collect the magnetic flux from the soft magnetic member, and wherein the magnetic sensor is disposed between the magnetic flux collecting portions.

16. An electric power steering device as set forth in claim 14, wherein said auxiliary soft magnetic members are installed within a resinous mold with an opening, the resinous mold having formed therein a chamber within which said magnetic sensor is disposed, the chamber having a conical wall that increases in diameter toward the opening and serves as a guide for insertion of said magnetic sensor into the chamber when said magnetic sensor is installed within the chamber.

17. An electric power steering device as set forth in claim 15, wherein said auxiliary soft magnetic members are installed within a resinous mold with an opening, the resinous mold having formed

therein a chamber within which said magnetic sensor is disposed, the chamber having a conical wall that increases in diameter toward the opening and serves as a guide for insertion of said magnetic sensor into the chamber when said magnetic sensor is installed within the chamber.

18. An electric power steering device as set forth in claim 14, wherein said magnetic sensor has terminals joined electrically to a substrate of said controller, and wherein said controller determines the steering assist torque as a function of the density of magnetic flux measured by said torque sensor.

19. An electric power steering device as set forth in claim 15, wherein said magnetic sensor has terminals joined electrically to a substrate of said controller, and wherein said controller determines the steering assist torque as a function of the density of magnetic flux measured by said torque sensor.

20. An electric power steering device as set forth in claim 18, wherein the substrate extends perpendicular to the terminals of said magnetic sensor.

21. An electric power steering device as set forth in claim 19, wherein the substrate extends perpendicular to the terminals of said magnetic sensor.

22. An electric power steering device comprising:

an electric motor;

a controller including a switching transistor working to control a duty cycle of current and a control substrate to which the switching transistor is connected electrically, said controller determining a steering assist torque to be outputted from said electric motor as a function of a steering torque added to a steering shaft;

a torque transmission mechanism working to transmit the steering assist torque outputted from said electric motor to the steering shaft; and

a shell made up of a housing within which said torque transmission mechanism is disposed and a cover closing an open end of the housing, the cover supporting the steering shaft through a bearing and having said controller secured to an inner wall thereof so that said controller is disposed within said shell.

23. An electric power steering device as set forth in claim 22, wherein said steering shaft includes a first shaft, a second shaft, and an elastic member which joins the first and second shafts in alignment with each other and twists subjected to input of the steering torque to one of the first and second shafts, and further comprising a torque sensor including (a) a hard magnetic member which is joined to the first shaft and produces a magnetic field therearound, (b) a soft magnetic member which is joined to the second shaft, placed within the magnetic field to form a magnetic

circuit, and works to change a density of magnetic flux produced in the magnetic circuit when the soft magnetic member is changed in relative position to the hard magnetic member due to twisting of the elastic member, (c) a pair of auxiliary soft magnetic members which is disposed close to the soft magnetic member, and (d) a magnetic sensor which works to measure a density of magnetic flux flowing between the auxiliary soft magnetic members as a function of the steering torque, and wherein one of the auxiliary soft magnetic members has a magnetic flux collecting portion which is opposed to the other auxiliary soft magnetic member in a radius direction of the steering shaft and functions to collect the magnetic flux from the soft magnetic member, and wherein the magnetic sensor is disposed between the magnetic flux collecting portion and said other auxiliary soft magnetic member.

24. An electric power steering device as set forth in claim 22, wherein said steering shaft includes a first shaft, a second shaft, and an elastic member which joins the first and second shafts in alignment with each other and twists subjected to input of the steering torque to one of the first and second shafts, and further comprising a torque sensor including (a) a hard magnetic member which is joined to the first shaft and produces a magnetic field therearound, (b) a soft magnetic member which is joined to the second shaft, placed within the magnetic field to form a magnetic circuit, and works to change a density of magnetic flux produced in the magnetic circuit when the soft magnetic member is changed in

relative position to the hard magnetic member due to twisting of the elastic member, (c) a pair of auxiliary soft magnetic members which is disposed close to the soft magnetic member, and (d) a magnetic sensor which works to measure a density of magnetic flux flowing between the auxiliary soft magnetic members as a function of the steering torque, and wherein the auxiliary soft magnetic members have magnetic flux collecting portions, respectively, which are opposed to each other in a radius direction of the steering shaft and function to collect the magnetic flux from the soft magnetic member, and wherein the magnetic sensor is disposed between the magnetic flux collecting portions.

25. An electric power steering device as set forth in claim 23, wherein said auxiliary soft magnetic members are installed within a resinous mold with an opening, the resinous mold having formed therein a chamber within which said magnetic sensor is disposed, the chamber having a conical wall that increases in diameter toward the opening and serves as a guide for insertion of said magnetic sensor into the chamber when said magnetic sensor is installed within the chamber.

26. An electric power steering device as set forth in claim 24, wherein said auxiliary soft magnetic members are installed within a resinous mold with an opening, the resinous mold having formed therein a chamber within which said magnetic sensor is disposed, the chamber having a conical wall that increases in diameter toward

the opening and serves as a guide for insertion of said magnetic sensor into the chamber when said magnetic sensor is installed within the chamber.

27. An electric power steering device as set forth in claim 23, wherein said magnetic sensor has terminals joined electrically to a substrate of said controller, and wherein said controller determines the steering assist torque as a function of the density of magnetic flux measured by said torque sensor.

28. An electric power steering device as set forth in claim 24, wherein said magnetic sensor has terminals joined electrically to a substrate of said controller, and wherein said controller determines the steering assist torque as a function of the density of magnetic flux measured by said torque sensor.

29. An electric power steering device as set forth in claim 27, wherein the substrate extends perpendicular to the terminals of said magnetic sensor.

30. An electric power steering device as set forth in claim 28, wherein the substrate extends perpendicular to the terminals of said magnetic sensor.